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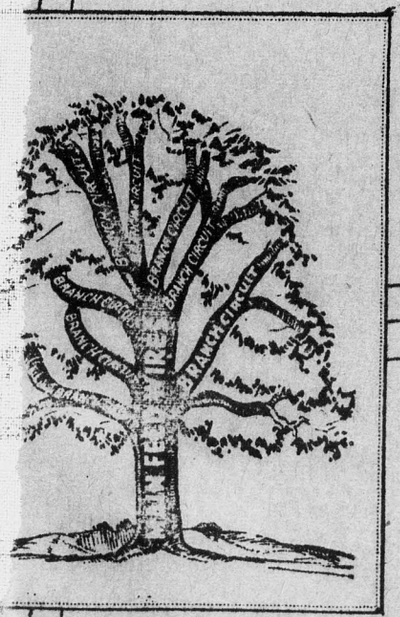
HOW TO PLAN YOUR ELECTRIC WIRING



by

Albert V. Krewatch

UNIVERSITY OF MARYLAND
EXTENSION SERVICE
COLLEGE PARK, MD

Cooperative Extension Work in Agriculture and Home Economics,
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United States Department of Agriculture, Cooperating

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DO NOT CIRCULATE

HOW TO PLAN YOUR ELECTRIC WIRING

by
Albert V. Krewatch
Specialist in Agricultural Engineering

Electric service in any home or on any farm means more than mere comfort convenience. It means the elimination of much drudgery and the protection of eyesight. It means the saving of time and labor, conservation of food products and the improvement of the health facilities of the family. Electricity is useless to us without the means of converting it into light, power and heat. Its cost in most instances is a profitable substitution for present expenses. Accordingly, the thousands of Maryland farm families receiving electricity for the first time will do well to give careful thought to the equipment that they may profitably provide themselves with and the wiring which is the heart of the electric system.

The term "wiring system" covers the combination of wires, cables, outlets and fittings which convey and control the electric current from the transformer at the road or in the yard, to the various points about the farm at which light, appliances or motors are required. The main and essential item in the system in addition to the outlets is the size of the wire or conductor which carries the current.

It is the purpose of this circular to offer suggestions that will help the rural family plan for electricity both wisely and economically. It is hoped that the rural families as well as wiring contractors will give careful consideration to these important factors in order to avoid future complaints and disappointments.

PLANNING FOR THE USE OF ELECTRICITY IS WISE AND ECONOMICAL

The first problem in connection with the use of electricity is that connected with a system of safe, adequate and convenient wiring. Wiring should be a profitable long term investment. It should not be planned for the furnishing of lights alone. Most people will want appliances, motors, cooking equipment, a refrigerator, and electric brooder or other of the many practical pieces of farm equipment.

Economy

For greatest economy, care in planning to make sure that enough outlets are put in and are properly located is important. It is much cheaper to install proper wiring at the beginning to take care of future needs than to rewire when additional equipment is to be installed. Often times needed and practical electrical equipment is not installed because of the cost of rewiring or replacing the entrance switch which has become too small to properly take care of the added load.

Adequacy

Enough circuits of proper size wire to take care of the lights and appliances should be installed. Thought should be given to the future, as well as the present needs of the family. Too small of wires carrying current at a given voltage will not deliver sufficient voltage to properly operate lights, motors and appliances. The length of the wire (distance) or the size of the wire (if too small) reduces the voltage. The result of this reduced voltage or inadequate wiring means decreased efficiency, increased current costs, creates dangers of overheating of the wires, and may result in burned out motors and equipment. Discuss these problems with your electrician, the representative of your serving organization or your State Extension Service Agent.

Convenience

Convenience means completeness as a result of careful planning. Here again consideration should be given to the needs of the entire farm family in light of their every day living habits. Leaving a switch or light out of some dark entry may save a dollar or two, but result in a serious accident that might have been avoided with a convenient light and switch.

Safety

Safe wiring is the responsibility of the home owner and can be had by hiring a reliable contractor who understands the work and knows the Fire Underwriter's code. Have your wiring inspected before approving the work or completing payment for it. The knowledge that the system is safe from the standpoint of fire hazard and electrical shock will more than offset the few dollars necessary for inspection.

TYPES OF OUTLETS AND THEIR LOCATION

There are in general three types of "outlets" to a farm wiring system: (1) the "light outlet", (2) the "switch outlet", and (3) the "convenience outlet" or "power outlet". Their location and number in a home is more or less an individual problem for each family. Your electrical contractor, utility, project engineer, home demonstration agent or county agent can help you.

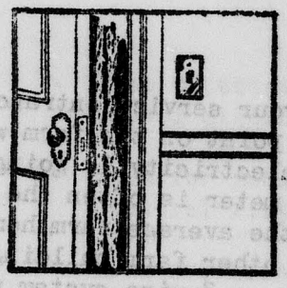
The light outlet is the one in which the lighting fixture is permanently installed. It may be in the ceiling or in the wall in the case of a bracket light. The switch outlet is the opening in the circuit where a switch is placed for the convenient control of lights or appliance outlets. A convenience outlet is the one designed for "plugging in" of an appliance or lamp and in the house is usually located near the baseboard. The power outlet is the special one to which equipment such as a motor, a stove, or a wall heater is connected. The equipment may be permanently connected or it may be connected by means of an unusually sturdy receptacle and plug.

Light Outlets

Center ceiling lights are for general illumination. Wall switches are advised in all cases for convenience and safety. Bracket lights are used where local lighting is required, as at a range, sink, ironing board, or mirror. In the living room and dining room their use is primarily decorative and they should be well shaded. There is no place in modern methods of lighting for the unshaded lamp. Detailed suggestions on lighting are given in Rural Electrification Series No. 3 "Better Light for Maryland Farm Homes " and No. 5 "Recommended Farm Lighting Practices".

Switches

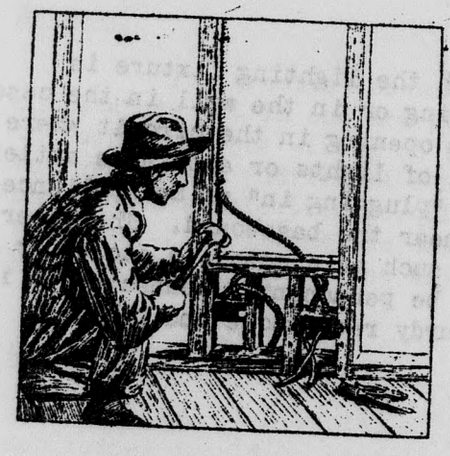
Wall switches are used in the home largely for the convenient control of lights. They are step-savers and time-savers and are most important in cellars and out of the way places. A one-way switch(S) is used when there is only one best place to turn a light on or off. Three-way switches (Sg) are used when it is desirable to control the light from two places, as the bottom and top of a stairway or at the two most used doors of a kitchen, dining room or living room. Switches should be located at the lock side of the door and approximately 52" from the floor. Four-way switches (S_4) are used where lights are controlled from three or more places.



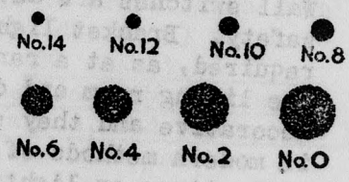
A WALL SWITCH

Convenience Outlets

Convenience outlets should be provided in each room for portable appliances and lamps first, because you will avoid the unsightly, hazardous entanglement of extension cords and second, because appliances should never be connected to overhead fixtures or wall bracket fixtures. It is an unsafe and unsatisfactory practice. The light socket is usually designed to accomodate the equivalent of two 100 watt lamps. A hand iron usually takes the equivalent of six 100 watt lamps and therefore the small wire in the fixture becomes dangerously hot or the iron does not heat properly.



When determing the number of outlets, it is best to study the needs of each room, and place an outlet between each pair of doors where wall space is large enough to accomodate a piece of furniture. An adequate recommendation is one outlet for each 15 to 20 feet of wall space. It is best not to locate the outlet in the center of the space where one cannot use it without moving the furniture. At the edge of a window is a good location. (See plan page 7). The outlets in the kitchen and dining room usually serve for heating appliances. No. 10 wire is suggested for this circuit. No. 12 wire is recommended for the other combined appliance and lighting circuits. No. 14 wire may be used for switches, lights and other outlets in out of the way places. It is much less expensive to provide these outlets initially than to wait until they are needed. An outlet can be put in at the time of wiring for a fraction of the cost of adding it later. In the above picture the electrician is putting an outlet in each side of the wall.

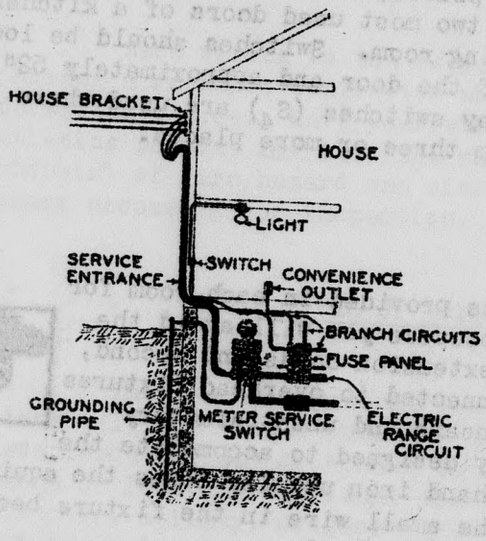


Wire Sizes

Special Outlets

Plan for and provide special outlets in rooms in which heavy duty appliances such as a range, space heater or water heater is to be used.

Service Entrance



Locate your service entrance at the most central point on the farm with regard to where electricity is going to be used. A pole meter is often the most practical. For the average farm home of 5 to 8 rooms and other farm buildings using electricity, a 3-wire system with a 60 ampere switch is recommended. At least No. 6 wire should be used because this will permit for future expansion, for example, a three horsepower motor and an electric range. It will save about $40 if the system should have to be enlarged and adds from $10 to $20 to the first cost. Larger wires and switches are often justified. Observe the requirements indicated by the plans of your home and farm buildings. If a 5 or 7½ horsepower motor is contemplated, a 3-wire, 100 ampere entrance should be installed.

Wiring Materials

Talk over with your electrician, local representative or Underwriter's inspector the use of:

1. Armored cable (BX) for the house and buildings.

Armored Cable

2. Non-metallic sheathed cable for house and buildings - recommended for horse barns and stables.

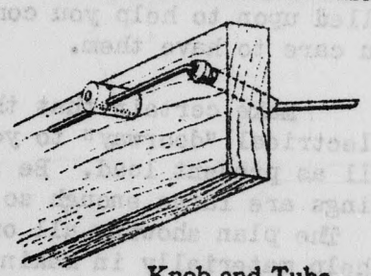
Non-metallic Sheathed Cable

3. Knob and tube wiring.

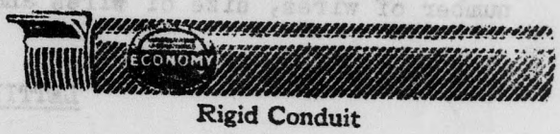
4. Conduit

5. Fuses for protection of branch circuits and equipment.

6. Circuit breakers for protection of branch circuits and motors.


Knob and Tube

7. Re-wiring or completing wiring that has been used for farm electric plant service.



Rigid Conduit

GENERAL SUGGESTIONS

1. Plan to obtain the most from your electric service and avoid the usual mistakes made in wiring a house for the first time.

2. Plan for good general lighting in each room. Consider an efficient central fixture for the dining room.

3. Plan for local lighting at the positions most used by the family.

4. Plan for the convenient control of lighting (switches).

5. Plan for the convenient use of small appliances. Those you plan to buy now as well as in the future.

6. Plan for the use of heavy duty appliances. Wire for them in the beginning, it is cheaper.

7. Locate lights, switches, outlets and equipment on simple floor plans. Home and farm buildings.

8. Have your utility representative or electrical contractor plan the wiring between buildings.

9. Discuss your plans with people who have had experience with the use of electricity.

10. Get wiring "bids" based on your plans. Make sure all "bids" are comparable, and that needed outlets and switches are not left out, that no inferior materials are used and that wire sizes are as recommended.

PLANS

First sketch a rough plan of the home and each building. Indicate on these sketches where each light, switch, outlet and piece of electrical equipment or motor is to be placed. (See page 7). The contractor can later show the circuits connecting these and secure your approval. The serving organization representative or local dealer or other experienced person may be called upon to help you complete the plan before securing competitive bids if you care to have them.

Make certain that the service entrance wires and switch that forms the electrical "doorway" to your farm will be large enough to carry future as well as present load. Be sure that the wires connecting the various farm buildings are large enough so that there will be little loss of energy in them. The plan showing all of the farm buildings and distances between them will help materially in making a satisfactory layout and should show the number of wires, size of wires and location of meter.

LETTING YOUR CONTRACT

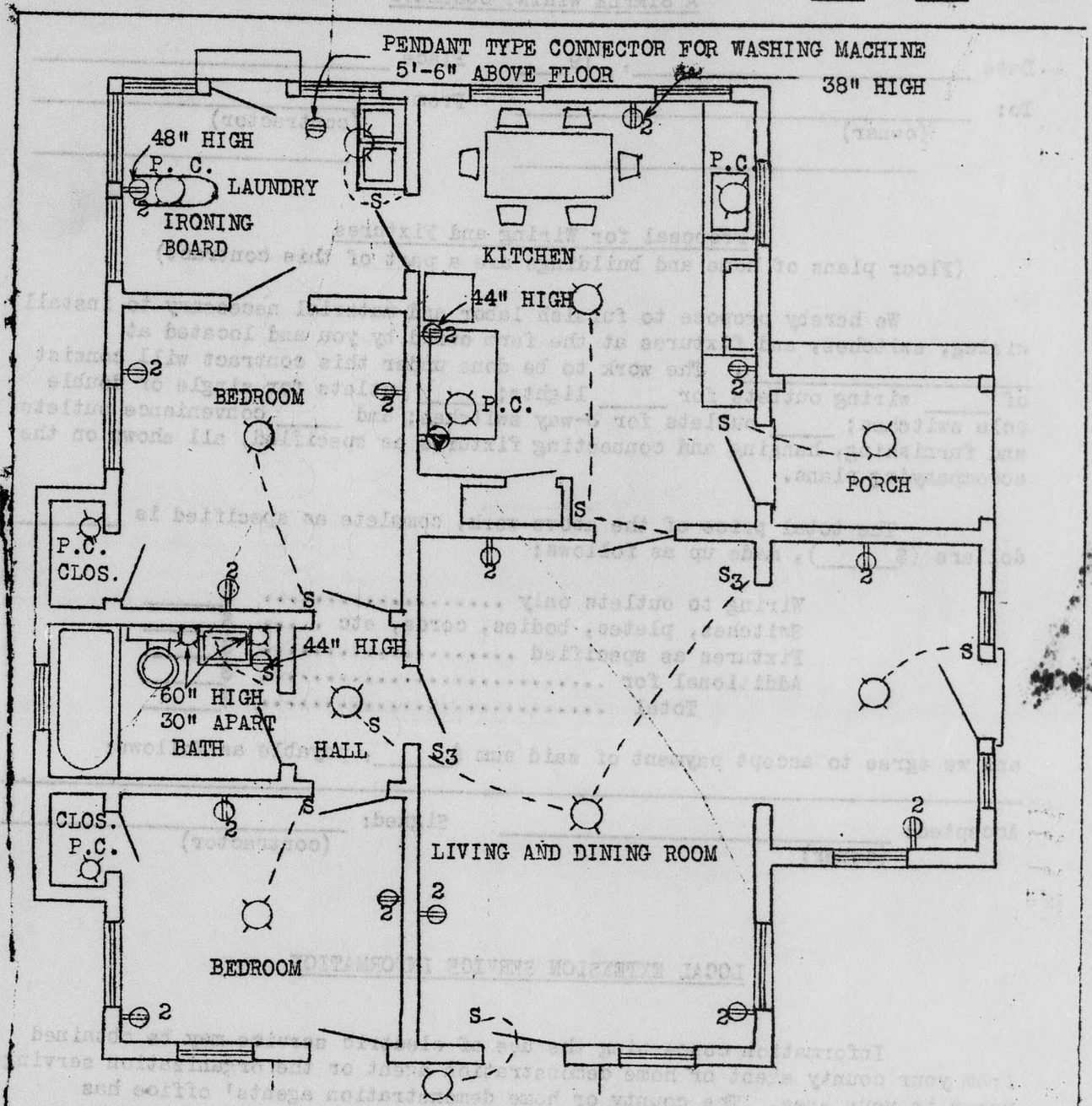
The information prepared will be of much greater value if put into writing or otherwise agreeded on by the owner and contractor. It is therefore desirable to have a plan on paper, discuss it with experienced advisors and enter into an understood contract (See page 8) with the worker selected to do the job.

Get a competent dependable electrical contractor to do your wiring, preferably a man in your own community or nearby who has been in business for some time and who has a reputation for good work. The competent man who has built up a good reputation is your best assurance for:

1. Intelligent planning
2. Selection of proper size and suitable material
3. Expert workmanship
4. Safety that will relieve you of worry
5. Fair prices
6. Service for your job should you need repairs
7. Financial and moral responsibility

Name _____ Address _____

1st floor Plan House Building Sketch No. 1 of 3 Sketches



	CEILING LIGHT OUTLET		ORDINARY DUPLEX CONVENIENCE OUTLET		SINGLE POLE SWITCH
	CEILING LIGHT OUTLET ON DROP CORD		ORDINARY SINGLE CONVENIENCE OUTLET		DOUBLE POLE SWITCH
	WALL LIGHT OUTLET		FLOOR CONVENIENCE OUTLET		THREE WAY SWITCH
	LIGHT WITH REFLECTOR		CEILING CONVENIENCE OUTLET		FOUR WAY SWITCH
	WALL LIGHT WITH CONV. OUTLET IN FIXTURE		CORD CONNECTOR ON DROP CORD		SWITCH WITH PILOT LIGHT
	MOTOR OUTLET (SHOW H.P.)		RADIO ANTENNA AND GROUND OUTLET		
	SPECIAL HEAVY DUTY OUTLET		SINGLE CONVENIENCE OUTLET WITH SWITCH		

(over)

A SIMPLE WIRING CONTRACT

Date _____, 19____ Place _____

To: _____ From _____
(owner) (contractor)

_____ _____

no. 4

Proposal for Wiring and Fixtures

(Floor plans of home and buildings are a part of this contract)

We hereby propose to furnish labor and material necessary to install wiring, switches, and fixtures at the farm owned by you and located at _____. The work to be done under this contract will consist of _____ wiring outlets for _____ lights; _____ outlets for single or double pole switches; _____ outlets for 3-way switches; and _____ convenience outlets, and furnishing, hanging and connecting fixtures as specified, all shown on the accompanying plans.

The total price of the above work, complete as specified is _____ dollars ($_____), made up as follows:

Wiring to outlets only	$_____
Switches, plates, bodies, cords, etc	$_____
Fixtures as specified	$_____
Additional for	$_____
Total	$_____

and we agree to accept payment of said sum $_____, payable as follows:

_____

Accepted: _____ Signed: _____
(owner) (contractor)

LOCAL EXTENSION SERVICE INFORMATION

Information concerning the use of electric service may be obtained from your county agent or home demonstration agent or the organization serving power in your area. The county or home demonstration agents' office has available information on nearly all phases of rural electrification.

"How to Get Electricity for Your Farm"
"The Cost of Electricity for Your Farm"
"Better Light for Maryland Farm Homes"
"Recommended Farm Lighting Practices"
"Uses for Electricity in the Home"
"Uses for Electricity on the Farm"
"Repair and Maintenance of Electric Equipment on the Farm for 4-H Clubs"
"Electric Equipment in the Home - Its Care and Repair"
"Your Small Motor - How to Increase Its Usefulness"

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Rural Electrification
Series, No. 5

March 1937

RECOMMENDED FARM LIGHTING PRACTICES

by

Albert V. Krewatch

UNIVERSITY OF MARYLAND LIBRARY

UNIVERSITY OF MARYLAND
EXTENSION SERVICE
COLLEGE PARK, MD

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